

Amendments to the Claims

Kindly amend claims 1, 14, 16, 29, 31, 34 & 47 and cancel claims 13, 28, 32, 33 & 46 (without prejudice) as set forth below. All pending claims are reproduced below, with changes in the amended claims shown by underlining (for added matter) and strikethrough/double brackets (for deleted matter).

1. (Currently Amended) A method of determining whether I/O constraints exist for controllers of a computing environment, said method comprising:

determining an I/O velocity for a controller of said computing environment, wherein said determining comprises employing a relationship between an amount of time waiting to use one or more resources of the controller and an amount of time using the one or more resources to determine the I/O velocity; and

using said I/O velocity to determine whether an I/O constraint exists for said controller.

2. (Original) The method of claim 1, wherein said determining comprises using the following equation:

$$\text{I/O Velocity} = \Sigma \text{ Device Connect Times} / (\Sigma \text{ Device Connect Times} + \Sigma (\text{Pending Times} - (\text{Control Unit Busy Times} + \text{Device Busy Times}))).$$

3. (Original) The method of claim 2, wherein said Σ Device Connect Times comprises an average of connect times associated with one or more devices of said controller collected over a predefined amount of time.

4. (Original) The method of claim 3, further comprising obtaining said average, said obtaining comprising:

adding connect times of said one or more devices collected over a predefined interval to obtain a sum for the predefined interval;

performing said adding for a plurality of intervals to obtain a plurality of sums; and

summing at least a portion of said plurality of sums to obtain a result and dividing said result by a number representing said at least a portion of said plurality of sums to obtain said average.

5. (Original) The method of claim 2, wherein said Σ Device Pending Times comprises an average of pending times associated with one or more devices of said controller collected over a predefined amount of time.

6. (Original) The method of claim 5, further comprising obtaining said average, said obtaining comprising:

adding pending times of said one or more devices collected over a predefined interval to obtain a sum for the predefined interval;

performing said adding for a plurality of intervals to obtain a plurality of sums; and

summing at least a portion of said plurality of sums to obtain a result and dividing said result by a number representing said at least a portion of said plurality of sums to obtain said average.

7. (Original) The method of claim 2, wherein said Σ Device Control Unit Busy + Device Busy Times comprises an average of control unit busy and device busy times associated with one or more devices of said controller collected over a predefined amount of time.

8. (Original) The method of claim 7, further comprising obtaining said average, said obtaining comprising:

adding control unit busy and device busy times of said one or more devices collected over a predefined interval to obtain a sum for the predefined interval;

performing said adding for a plurality of intervals to obtain a plurality of sums; and

summing at least a portion of said plurality of sums to obtain a result and dividing said result by a number representing said at least a portion of said plurality of sums to obtain said average.

9. (Original) The method of claim 2, wherein said controller is accessible by one or more partitions of a central processing complex, and wherein the device connect times, the pending times and the control unit busy and device busy times reflect data from the one or more partitions.

10. (Original) The method of claim 1, wherein said using comprises comparing said I/O velocity to a target I/O velocity to determine whether said I/O constraint exists, wherein said I/O constraint exists when said I/O velocity is not within a tolerance of said target I/O velocity.

11. (Original) The method of claim 1, wherein said controller comprises a control unit and said I/O constraint comprises a lack of communications bandwidth.

12. (Original) The method of claim 11, wherein the communications bandwidth comprises channel bandwidth.

13. (Canceled).

14. (Currently Amended) The method of claim [[13]] 1, wherein said controller comprises a control unit and said one or more resources comprise one or more channels of the control unit.

15. (Original) The method of claim 1, wherein said controller comprises one of the following:

a processor communicating with another processor; and

a single device.

16. (Currently Amended) A system of determining whether I/O constraints exist for controllers of a computing environment, said system comprising:

means for determining an I/O velocity for a controller of said computing environment, wherein said means for determining comprises means for employing a relationship between an amount of time waiting to use one or more resources of the controller and an amount of time using the one or more resources to determine the I/O velocity; and

means for using said I/O velocity to determine whether an I/O constraint exists for said controller.

17. (Original) The system of claim 16, wherein said means for determining comprises means for using the following equation:

$$\text{I/O Velocity} = \frac{\sum \text{Device Connect Times}}{(\sum \text{Device Connect Times} + \sum (\text{Pending Times} - (\text{Control Unit Busy Times} + \text{Device Busy Times})))}$$

18. (Original) The system of claim 17, wherein said $\sum \text{Device Connect Times}$ comprises an average of connect times associated with one or more devices of said controller collected over a predefined amount of time.

19. (Original) The system of claim 18, further comprising means for obtaining said average, said means for obtaining comprising:

means for adding connect times of said one or more devices collected over a predefined interval to obtain a sum for the predefined interval;

means for performing said adding for a plurality of intervals to obtain a plurality of sums; and

means for summing at least a portion of said plurality of sums to obtain a result and dividing said result by a number representing said at least a portion of said plurality of sums to obtain said average.

20. (Original) The system of claim 17, wherein said ΣDevice Pending Times comprises an average of pending times associated with one or more devices of said controller collected over a predefined amount of time.

21. (Original) The system of claim 20, further comprising means for obtaining said average, said means for obtaining comprising:

means for adding pending times of said one or more devices collected over a predefined interval to obtain a sum for the predefined interval;

means for performing said adding for a plurality of intervals to obtain a plurality of sums; and

means for summing at least a portion of said plurality of sums to obtain a result and dividing said result by a number representing said at least a portion of said plurality of sums to obtain said average.

22. (Original) The system of claim 17, wherein said ΣDevice Control Unit Busy + Device Busy Times comprises an average of control unit busy and device busy times associated with one or more devices of said controller collected over a predefined amount of time.

23. (Original) The system of claim 22, further comprising means for obtaining said average, said means for obtaining comprising:

means for adding control unit busy and device busy times of said one or more devices collected over a predefined interval to obtain a sum for the predefined interval;

means for performing said adding for a plurality of intervals to obtain a plurality of sums; and

means for summing at least a portion of said plurality of sums to obtain a result and dividing said result by a number representing said at least a portion of said plurality of sums to obtain said average.

24. (Original) The system of claim 17, wherein said controller is accessible by one or more partitions of a central processing complex, and wherein the device connect times, the pending times and the control unit busy and device busy times reflect data from the one or more partitions.

25. (Original) The system of claim 16, wherein said means for using comprises means for comparing said I/O velocity to a target I/O velocity to determine whether said I/O constraint exists, wherein said I/O constraint exists when said I/O velocity is not within a tolerance of said target I/O velocity.

26. (Original) The system of claim 16, wherein said controller comprises a control unit and said I/O constraint comprises a lack of communications bandwidth.

27. (Original) The system of claim 26, wherein said communications bandwidth comprises channel bandwidth.

28. (Canceled).

29. (Currently Amended) The system of claim [[28]] 16, wherein said controller comprises a control unit and said one or more resources comprise one or more channels of the control unit.

30. (Original) The system of claim 16, wherein said controller comprises one of the following:

a processor communicating with another processor; and

a single device.

31. (Currently Amended) A system of determining whether I/O constraints exist for controllers of a computing environment, said system comprising:

a first processor to determine an I/O velocity for a controller of said computing environment; [[and]]

a second processor to use said I/O velocity to determine whether an I/O constraint exists for said controller; and

wherein the first processor and the second processor are different processors.

32. (Canceled).

33. (Canceled).

34. (Currently Amended) At least one program storage device readable by a machine, tangibly embodying at least one program of instructions executable by the machine to perform a method of determining whether I/O constraints exist for controllers of a computing environment, said method comprising:

determining an I/O velocity for a controller of said computing environment, wherein said determining comprises employing a relationship between an amount of time waiting to use one or more resources of the controller and an amount of time using the one or more resources to determine the I/O velocity; and

using said I/O velocity to determine whether an I/O constraint exists for said controller.

35. (Original) The at least one program storage device of claim 34, wherein said determining comprises using the following equation:

$$\text{I/O Velocity} = \frac{\sum \text{Device Connect Times}}{(\sum \text{Device Connect Times} + \sum (\text{Pending Times} - (\text{Control Unit Busy Times} + \text{Device Busy Times})))}$$

36. (Original) The at least one program storage device of claim 35, wherein said $\sum \text{Device Connect Times}$ comprises an average of connect times associated with one or more devices of said controller collected over a predefined amount of time.

37. (Original) The at least one program storage device of claim 36, wherein said method further comprises obtaining said average, said obtaining comprising:

adding connect times of said one or more devices collected over a predefined interval to obtain a sum for the predefined interval;

performing said adding for a plurality of intervals to obtain a plurality of sums; and

summing at least a portion of said plurality of sums to obtain a result and dividing said result by a number representing said at least a portion of said plurality of sums to obtain said average.

38. (Original) The at least one program storage device of claim 35, wherein said Σ Device Pending Times comprises an average of pending times associated with one or more devices of said controller collected over a predefined amount of time.

39. (Original) The at least one program storage device of claim 38, wherein said method further comprises obtaining said average, said obtaining comprising:

adding pending times of said one or more devices collected over a predefined interval to obtain a sum for the predefined interval;

performing said adding for a plurality of intervals to obtain a plurality of sums; and

summing at least a portion of said plurality of sums to obtain a result and dividing said result by a number representing said at least a portion of said plurality of sums to obtain said average.

40. (Original) The at least one program storage device of claim 35, wherein said Σ Device Control Unit Busy + Device Busy Times comprises an average of control unit busy and device busy times associated with one or more devices of said controller collected over a predefined amount of time.

41. (Original) The at least one program storage device of claim 40, wherein said method further comprises obtaining said average, said obtaining comprising:

adding control unit busy and device busy times of said one or more devices collected over a predefined interval to obtain a sum for the predefined interval;

performing said adding for a plurality of intervals to obtain a plurality of sums; and

summing at least a portion of said plurality of sums to obtain a result and dividing said result by a number representing said at least a portion of said plurality of sums to obtain said average.

42. (Original) The at least one program storage device of claim 35, wherein said controller is accessible by one or more partitions of a central processing complex, and wherein the device connect times, the pending times and the control unit busy and device busy times reflect data from the one or more partitions.

43. (Original) The at least one program storage device of claim 34, wherein said using comprises comparing said I/O velocity to a target I/O velocity to determine whether said I/O constraint exists, wherein said I/O constraint exists when said I/O velocity is not within a tolerance of said target I/O velocity.

44. (Original) The at least one program storage device of claim 34, wherein said controller comprises a control unit and said I/O constraint comprises a lack of communications bandwidth.

45. (Original) The at least one program storage device of claim 44, wherein said communications bandwidth comprises channel bandwidth.

46. (Canceled).

47. (Currently Amended) The at least one program storage device of claim [[46]] 34, wherein said controller comprises a control unit and said one or more resources comprise one or more channels of the control unit.

48. (Original) The at least one program storage device of claim 34, wherein said controller comprises one of the following:

a processor communicating with another processor; and

a single device.

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